PATENT ABSTRACTS OF JAPAN

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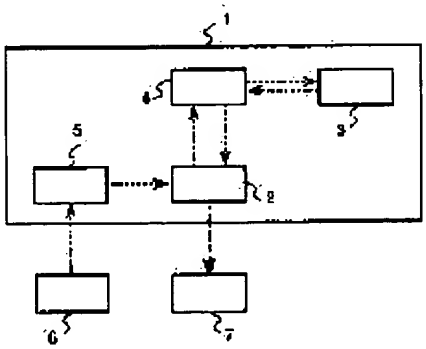
(54) TREATMENT OF PRINTED CIRCUIT BOARD MOUNTED WITH ELECTRONIC PARTS AND APPARATUS THEREFOR

(57)Abstract:

PROBLEM TO BE SOLVED: To separate circuit boards and parts, to recycle both and to make the circuit boards and the parts non-polluting by accumulating the information on the method for separating the mounted electronic parts and the circuit boards relating thereto and a method for recycling the parts and making the parts non-polluting into a data base, inputting the identification information of the electronic parts and retrieving and outputting the required information from this data base in accordance with this information.



SOLUTION: The image information on the circuit boards mounted with the parts taken in by a camera 6 is inputted to an image analyzing means 5 and the results thereof are inputted to an image processing means 2. A retrieval means 4 reads in retrieval information and specifies the kinds of the parts by collating the image analysis information and the retrieval information. The information on the parts accumulated in the data base 3 is successively inputted to the information processing means 2 after the kinds of the parts are specified. When the information on the sepn. of the parts and the circuit boards is first inputted, a control signal is outputted to a separating and transporting

device 7 and the parts are separated from the circuit boards. Next, the classification information on the material, the method for recycling the materials, the method for making the materials non-polluting and the like is read in and a control signal is outputted to the separating and transporting device 7 in accordance therewith, by which the classifying and recovering work is controlled.

LEGAL STATUS

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to recycling of the discarded electronic-parts loading printed-circuit board, the harmless-ized method, and its equipment.
[0002]
[Description of the Prior Art] In connection with the rapid progress of electronic industry, the electronic equipment which the station of all occupational descriptions does not reach for saying, but is represented by domestic at a computer etc. came to be used. Almost all products contain that by which electronic parts, such as an integrated circuit (IC), and resistance, a capacitor, were carried on the sheet metal which **********ed the electrical circuit called printed-circuit board, and it has played the brains-role of a product.
[0003] On the other hand, the amount of the waste of such an electronic product is also increasing every year, and the problem of processing of a printed-circuit board (it is hereafter called an element-placement substrate) in which electronic parts were carried in connection with it has been actualizing it. The method of collecting the heat which carries out incineration processing and which is generated as the recycling method of an element-placement substrate in that case as heat energy is enforced partly. Moreover, the post-classification which carbonized the pitch in a printed circuit board is performed, and there are a method (JP,2-88725,A) of carrying out separation recovery of the valuables, such as copper metallurgy, the method (JP,6-296957,A) of heating and pulverizing a printed-circuit board and using as a bulking agent of structure material, building materials, or an insulating material, etc.
[0004]
[Problem(s) to be Solved by the Invention] While various toxic substances, such as arsenic, cadmium, lead, mercury, and antimony, are contained in electronic parts (it is hereafter called parts) and such parts had been carried, when processing, in incineration processing and carbonization processing of an element-placement substrate which were mentioned above, a toxic substance will be emitted into the atmosphere as it is, an advanced offgas treatment facility must be installed, and, also technically, there are many problems also in cost. Even when processing the remaining dust after collecting valuable metals furthermore by reclamation, a detrimental object which was mentioned above from dust is eluted, and we are anxious about having a bad influence on circumference environment. Moreover, when reusing as a bulking agent of structure material, building materials, or an insulating material, it is at the abandonment time during use, and as mentioned above, there is a problem of the circumference environmental pollution by elution of a detrimental object. Furthermore, when parts reusable as it is were in the parts carried, it had processed as waste.
[0005]
[Means for Solving the Problem] this invention solves this technical problem and it for the purpose of the recycling and harmless-izing of an element-placement substrate which were discarded as the first means As having the database which accumulated the information about information, such as a configuration, a color, and a size, the information about the quality of the material, a kind, an amount of

a toxic substance to contain, etc., the information about the separation method of parts and a substrate, and the information about recycling and the harmless-ized method of parts according to the kind of parts, and the second means The information about the quality of the material of the part, the information about the kind and amount of a toxic substance to contain, the information about the separation method with a substrate, and the information about recycling and the harmless-ized method are searched and outputted from the aforementioned database by inputting the information about the appearance of parts, such as a configuration, a color, and a size.
[0006] Moreover, as third means, separation with a printed circuit board and parts, and recycling and harmless-ized processing are performed based on the information outputted from the aforementioned database.
[0007] Furthermore, an image recognition performs the information about the appearance of parts, such as a configuration of parts, a color, and a size, as the fourth means.
[0008] In this invention, the information about recycling and harmless-izing of an element-placement base is promptly acquired by the first means mentioned above. Furthermore, by creating a database which was mentioned above based on design information in the manufacture stage of an element-placement substrate, when an element-placement substrate is discarded in the future, there is operation that the information about recycling and harmless-izing is promptly acquired from a database.
[0009] Next, it can respond also to the element-placement substrate of the miscellaneous kind which consists of various manufacturers easily by the second means using the information acquired from appearance, such as a configuration of parts, a color, and a size, as information inputted in order to acquire the various information accumulated at the database, and there is operation that the information about recycling and harmless-izing is promptly acquired from a database.
[0010] Moreover, by third means to perform separation with a printed circuit board and parts, and recycling and harmless-ized processing based on the information outputted from the database, since recycling and harmless-ized processing can perform the discarded element-placement substrate by the optimal method, the environmental load accompanying processing decreases and the burden of exhaust gas, waste water treatment, etc. decreases.
[0011] Furthermore, according to the fourth means, automation of the process to the output of the information from [from the input of the information about the configuration of the parts to a database, a color, a size, etc.] a database can be attained by discriminating the configuration of parts, a color, a size, etc. by the image recognition.
[0012]
[Embodiments of the Invention] Hereafter, although an example explains the content of this invention concretely, this invention is not limited to this example at all.
[0013] The block diagram of the system of a control system is shown in drawing 1 .
[0014] Separation and a transport device 7 are controlled by separation and the transfer-control machine 1, and separation and the transfer-control machine 1 are equipped with the database 3 which accumulated the part information about electronic parts, the reference means 4 searches this database 3, the information processing means 2 processes the extracted information, and it outputs a control signal to separation and a transport device 7.
[0015] In order to photo the state of an element-placement substrate, the camera 6 is installed and the image information obtained with the camera 6 is inputted into separation and the transfer-control machine 1. Separation and the transfer-control machine 1 are equipped with an image analysis means 5 to analyze image information, and an analysis result is sent to the information processing means 2.
[0016] On the other hand, the information about the information about a configuration, a color, a size, etc., the information about the quality of the material, the information about the kind of toxic substance to contain and an amount, the information about the separation method of parts and a substrate, the recycling method, and the harmless-ized method is accumulated for every kind of parts at the database 3.

[0017] Based on the data about the parts extracted from the database by the reference means 4, the information processing means 2 outputs a concrete control signal to separation and a transport device 7,

and controls separation / conveyance work.
[0018] Subsequently, the procedure by the information processing means 2 is explained.
[0019] First, the image information of the element-placement substrate incorporated with the camera 6 is inputted into the image analysis means 5. And the image analysis means 5 analyzes image information, and the result is inputted into the information processing means 2. On the other hand, the information (it is hereafter called reference information) which the reference means 4 searched is read, and image analysis information and reference information are collated.
[0020] Image analysis information is actual information which analyzed and obtained the image information which the camera obtained, and is information about the configuration of electronic parts, a color, a size, etc. Moreover, reference information is information for every parts about the configuration accumulated at the database 3, a color, a size, etc. here. And image analysis information and reference information are collated and the kind of parts is specified.
[0021] After the kind of parts is specified, the information about the part accumulated at the database 3 is inputted into an information processing means one by one. First, if the information about separation with parts and a substrate is inputted first, a control signal will be outputted to separation and a transport device 7, and separation work will be controlled. If parts are separated from a substrate, subsequently the information about the classification of the quality of the material of parts, the recycling method, the harmless-ized method, etc. will be read, a control signal will be outputted to separation and a transport device 7 according to this information, and a classification and recovery work will be controlled.
[0022] As mentioned above, according to this example, since the kind of the part can be specified from the appearance of electronic parts, suitable recycling processing or harmless-ized processing of all the discarded element-placement substrates is attained.
[0023] Subsequently, the example is explained about how to specify electronic parts from appearance using drawing 2 . Drawing 2 shows an example of the database about electronic parts. The feature of appearance is shown about each part. For example, when a configuration fulfills [the image information of the parts read into the information processing means 2] the conditions which a prism and height call smallness and a color calls black, the part is distinguished from IC.
[0024] Thus, according to this example, when the feature of the appearance of parts combines, the kind of parts can be distinguished and it becomes it is automatic and possible to specify the kind of parts.
[0025] Next, the example is shown in drawing 3 about separation and a transport device 7. In addition, this example consists of cables 15 for exchanging information with the separation and the transport device 7 in which the camera 6 is built, separation, the transfer-control machine 1 and separation and a transport device 7, and separation and a transfer-control machine 1.
[0026] The heat carrier 9 for supplying the heat for fusing the solder which has joined the substrate to parts to the element-placement substrate 10 is contained in the heat carrier sink 8, and the element-placement substrate 10 turns parts upward, and is carried on a heat carrier 9. The heat carrier sink 8 is accompanied, two or more robot arm 11 is arranged, and any robot arm 11 is equipped with the camera 6 at the nose of cam. Moreover, the robot arm 11 is equipped with the adsorption head 13 which can adsorb the robot hand 12 or flat package parts which can grasp the parts other than a camera 6. Moreover, the collection box 14 by type is arranged behind these robot arms 11. Recycling or the harmless-ized method of parts, the kind of parts, the quality of the material of parts, etc. respond, and the collection box 14 by type is divided.
[0027] Now, the element-placement substrate 10 is carried on the heat carrier 9 included in the heat carrier sink 8, and it is conveyed, and comes before the robot arm 11 of the best style. The image information of the parts which the camera 6 with which the robot arm 11 is equipped caught is inputted into the image analysis means 5 in separation and the transfer-control machine 1 through a cable 15, turns into image analysis information, and is outputted to the information processing means 2. Subsequently, the information which the reference means 4 searched is read into the information processing means 2, and it collates with image analysis information, consequently the kind of parts is specified. Simultaneously with it, the method about the information about the separation method of parts and a substrate, the recycling method, and the harmless-ized method etc. is outputted to the robot arm 11

one by one through a cable 15 based on this reference information. And based on the information about the separation method, it dissociates from a substrate, and even the collection box 14 by type divided according to the kind of the part, the quality of the material, the recycling method, etc. is conveyed, and parts are thrown in by the robot hand 12 or the adsorption head 13 linked to the robot arm 11.
[0028] Here, the informational exchange with separation and a transport device 7, and separation and a transfer-control machine 1 may use radio. Moreover, you may use the image information which not only the image information obtained from one camera but two or more cameras caught as image information for distinguishing parts. Metal melt, inorganic fine particles, a high-boiling point organic solution, etc. can be used for a heat carrier. Furthermore, in order to make parts easy to separate from a substrate, before carrying the element-placement substrate which is a processing object on a heat carrier, you may cut the lead wire of the parts projected at the substrate rear face.
[0029] Thus, since separation and the transport device 7 of this example perform separation, conveyance, and judgment automatically altogether if parts-recognition information is inputted into separation and the transfer-control machine 1, an effort is cut down sharply and it does not need to do the work by the help in an inferior environment. Moreover, since parts can also be classified and collected for every kind, respectively, the rate of reproduction / reuse can be raised.
[0030]
[Effect of the Invention] since the kind of parts can be specified from the appearance of the electronic parts carried in the discarded printed-circuit board according to this invention -- every parts -- the respectively optimal method -- harmless-izing -- or it is recyclable Consequently, the complicated offgas treatment which had become a problem on the occasion of batch processing, such as incineration which was being performed conventionally, and spallation, reclamation, the exsorption to the circumference environment of a toxic substance, etc. are solvable. Furthermore, by recognizing the information about the appearance of parts by the image recognition, it is automatic and all processes until it results [from separation of parts and a substrate] in harmless-izing and recycling can be performed.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram of the system of the basic control system of this invention.
[Drawing 2] Explanatory drawing of the database about the electronic parts concerning this invention.
[Drawing 3] The perspective diagram of the separation and the transport device concerning this invention.
[Description of Notations]
1 [-- A database, 4 / -- A reference means, 5 / -- An image analysis means, 6 / -- A camera, 7 / -- Separation / conveyance means.] -- Separation and a transfer-control machine, 2 -- An information processing means, 3

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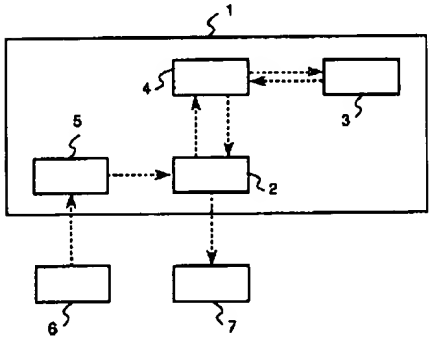
DRAWINGS

[Drawing 1]

図 1



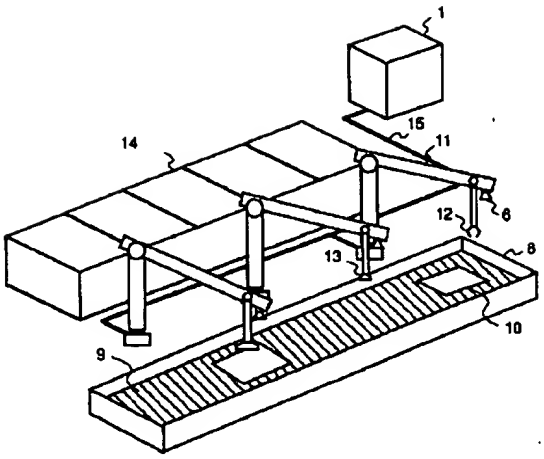
[Drawing 2]

図 2

特徴 \ 部品		コネクタ	IC	コンデンサ
				
形状	角柱	○	○	
	円柱			○
	その他			
寸法	高さ：大	○		○
	高さ：小		○	
色	黒		○	
	その他	○		○

[Drawing 3]

図 3



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